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COMING NEXT MONTH

These Associations Can Help You. Users of concrete can benefit from the technical assistance programs, research endeavors, information services and committee activities of an impressive group of trade associations and technical societies. This article provides information concerning some of the more important ones.

Experience With Epoxy Resins. Originally scheduled for the April issue, this down-to-earth discussion of the versatile epoxies has been held over for the May issue because of space limitations.

Color On Concrete. As a follow-up to this month's article on color *in* concrete, next month we'll have something to say concerning the methods of coloring concrete after it has hardened.

Over 33,000 copies mailed. Edited for all who are concerned with quality, job placed concrete (including prestress, tilt-up, lift slab, and thin-shell)—its specification, production, handling, forming, reinforcing, placing, finishing, and curing: *Concrete Contractors, General Contractors, Engineers, Architects, Industrial Construction and Maintenance Men, Highway Engineers, Ready-Mixed and Prestressed Concrete Producers.*

About our page numbers: The pages of Concrete Construction Magazine are numbered continuously from January through December each year as a means of facilitating the use of bound volumes for reference purposes.

COLOR IN CONCRETE

Part I—Integral Color

Color may be added to concrete while it is still in the plastic state or after it has completely hardened. Part I describes the various techniques for introducing color into the plastic mix.

Next month, Part II will cover the methods for applying color to the hardened surface of concrete.

WE LIVE IN AN AGE OF SALES AS A SCIENCE. Advertising agencies, public relations firms and other public opinion molding groups have developed their art to the point where they can precisely calculate just what effect sales techniques will have upon intended audiences. Many critics of American life have expressed alarm at the power wielded by such groups in influencing public feeling toward products, people and ideas. A highly important weapon in their arsenal of sales techniques is the knowing use of color. Many are the household products for which more time and money have been spent on the packaging than on the contents.

Colors can excite or depress, attract or repel, catch the eye or recede into the background. Even the ancients recognized the power of colors to move people. The statues and ruins of ancient Greece and Rome are usually thought of in their present colorless state but old writings point out that they were vividly colored with paints when new. The Dark Ages brought a lifeless color scheme for men—even the great cathedrals were drab in this respect. But today's American architect, faced with the need to use many standardized building components, has unmistakably turned to color as the answer to the need for life and character in construction.

Concrete is capable, as are few other building materials, of a spectrum that will prove compelling to architects and owners alike. Two basic approaches are available for the introduction of color in concrete—integral and applied—and we shall subdivide our survey accordingly. Several techniques fall within each category and the choice of one rests upon the conditions experienced on each job, including type of application, exposure, traffic, depth of color, available funds and whether a design is desired.

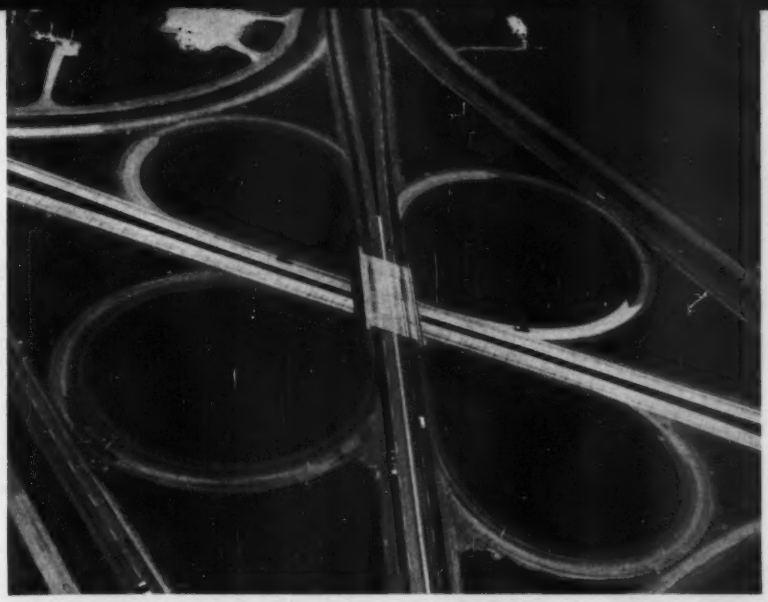
INTEGRAL COLOR

Grouped under this heading will be techniques wherein the color is introduced while the concrete is still in a plastic state. This includes coloring agents affecting the cement paste, decorative aggregates and combinations of these two.

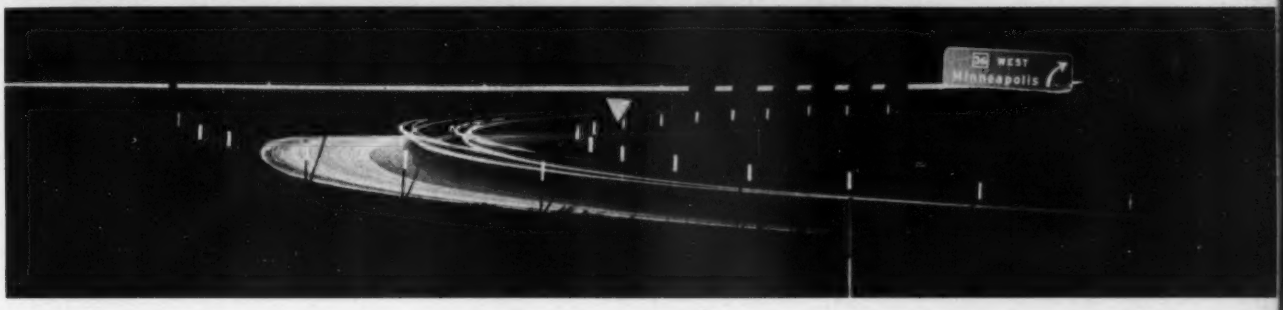
pigments

Practically all coloring of cement pastes in this country is achieved with synthetic or natural pigments. Iron oxides seem to be the most common type. Organic pigments were once used but because they have an adverse effect on the strength of concrete and are of questionable durability, they have fallen into disuse.

Natural mineral pigments (or mortar colors, as they are sometimes called) can be merely mined ores which have been ground or they can be calcined, washed and ground ores. Naturally, the shade of such natural coloring agents varies with the chemical composition of the ore, especially



These two photos show the astonishing brightness of colored concrete ramp surfaces. The night photo below shows a highly reflective yellow ramp surface recently put down at a cloverleaf interchange in tests conducted by the Department of Highways, State of Minnesota. In the photo at the left, the turnoffs and exit ramps are blue, while the on-ramps and points of merging traffic are yellow to distinguish the difference. Both interchanges in Minnesota are just another aspect of the rapid increase in interest in colored concrete for a multitude of purposes.



the red and yellow ores. This is compensated for by a blending process to maintain a reasonable standard of uniformity. Colors available in this type include black iron oxide, red and brown hematite, and yellow ocher or limonite. When buying natural mineral pigments, it is advisable to purchase all that will be needed at one time and from one source to insure a constant color.

Synthetic mineral pigments are produced from metal salts by precipitation, calcination and other methods. Since they are manufactured by a chemical reaction process, these pigments are freer from impurities and more uniform than natural types. The Portland Cement Association has published the following suggestions for concrete-coloring agents: use cobalt oxide for blues, brown oxide of iron for browns, synthetic yellow oxide of iron for buffs, chromium oxide for greens, red oxide of iron for reds, and black iron oxide or a carbon black easily miscible in water for grays or black.

The choice of either a natural or a synthetic pigment should be based upon several factors. Natural pigments are low in cost and when a medium shade is desired, they might prove most economical and practical. Unfortunately, their coloring power works only to a certain point, depending on the ore, after which further additions will only lighten the shade. Synthetic oxide pigments can be used to obtain practically any desired shade. Also, the range of colors in synthetic pigments is considerably broader than in their natural counterparts. Another factor in favor of synthetic pigments is that they can be ground finer. This gives them from two to five times greater tinctorial power than natural pigments.

When buying pigments, one general rule to follow is to regard with some skepticism materials priced below six cents per pound or those which have less than 70 percent Fe_2O_3 when priced over that amount. The cost limitation covers the natural mineral oxides, and the second limitation refers to certain pigments (such as Venetian red oxides) which, due to their high content of water-soluble gypsum, cause deterioration of concrete during freeze-thaw cycles.

An important prerequisite of pigments is that they must be resistant to the action of alkalies (lime). This quality can be tested by mixing a sample of twenty parts cement and one part pigment and keeping the specimen moist for one week. If fading is noted, the pigment should be rejected as unstable for use in concrete. Another requirement is that the pigment be unaffected by exposure to light. Unfortunately, there is no easy means of testing this characteristic. The customer must rely on field experience and the results of tests run by the manufacturer.

If pigments are to be mixed in the concrete, they are usually batched (always by weight, not vol-

Here a workman is dusting a mineral oxide pigment mixed with sand over a freshly placed slab. This is done after all free surface water has evaporated. In troweling to a smooth finish it is important that no water be brought to the surface.

ume) dry with the aggregates and cement, mixed and then the water is added and the entire batch is given its final mixing. It is virtually impossible to state any rules regarding the amount of pigments to add (trial batches, placed, finished and cured are the only reliable means of determining this), but here's a very general rule of thumb that some contractors use as a starting point. Assuming average potency synthetic mineral oxides and white cement, one-half to one pound per bag of cement is used for pastels. With gray cements, one to three pounds will be needed. From four to nine pounds per bag of cement will be required for darker shades, depending upon the intensity wanted. The higher the water content of the mix, the lighter will be the final color. For this reason, it is especially important that formwork be fully prepared when colored ready mixed concrete is delivered, since prolonged mixing can cause color variations. Pigments can also be combined to produce custom colors.

Another means of attaining colored concrete is by the dusting technique. Although it is practical only for horizontal surfaces, it does provide a relatively easy, low-cost way of coloring concrete. Again it is difficult to prescribe any set mix design but the following suggested proportions might be helpful in developing specific mixes in the field:

7 Tips for Success with Colored Ready-Mixed Concrete

Courtesy of Frank D. Davis Company

batching

1. Weigh color before adding to batch.
2. Add color directly into mixer drum with aggregate and cement.
3. Formulate concrete by using a water reducing agent, which also acts as a color and cement dispersing agent (calcium lignin sulfonate type or equal).
4. Clean out mixer drum by putting into the drum 10 gallons of clean water on return trip to batch plant, and flush before filling next batch.

placing

5. Place concrete at fairly stiff and buttery consistency. Slump should be 4" or less; in a hot climate, a 5" slump is permissible.
6. Finishing should be done carefully and uniformly. Overtroweling is to be avoided.
7. Prevent moisture evaporation from finished surface by any one of the following methods:

   a) Spraying or swabbing of liquid wax as soon as conditions will permit.

   b) Apply a clear sealing compound.

   c) Cover surface with polyethylene film or paper, avoiding all wrinkles and air pockets, and apply sand layer on top of it to insure continuous tight contact with wet concrete surface. Bubbles in protective film will cause spotting and variation of surface color.

   d) Place 2 inches of sand over entire surface and keep wet.

   e) Water curing should be continuous flooding only. No alternate wetting and drying is advised.

two parts cement to two parts sand to one part synthetic mineral oxide pigment. The sand should have at least 80 percent passing a No. 8 sieve and not more than three percent passing a No. 30 sieve. (About five or six pounds of pigment is needed for 100 square feet of surface.)

It is important that the mixture be thoroughly mixed dry until no color streaking is present. Sprinkle this mixture evenly over the surface to be colored after all puddles and surface water have evaporated. Trowel to a smooth finish making sure that no water is brought to the surface, since this would cause loss of color after the slab is put into use.

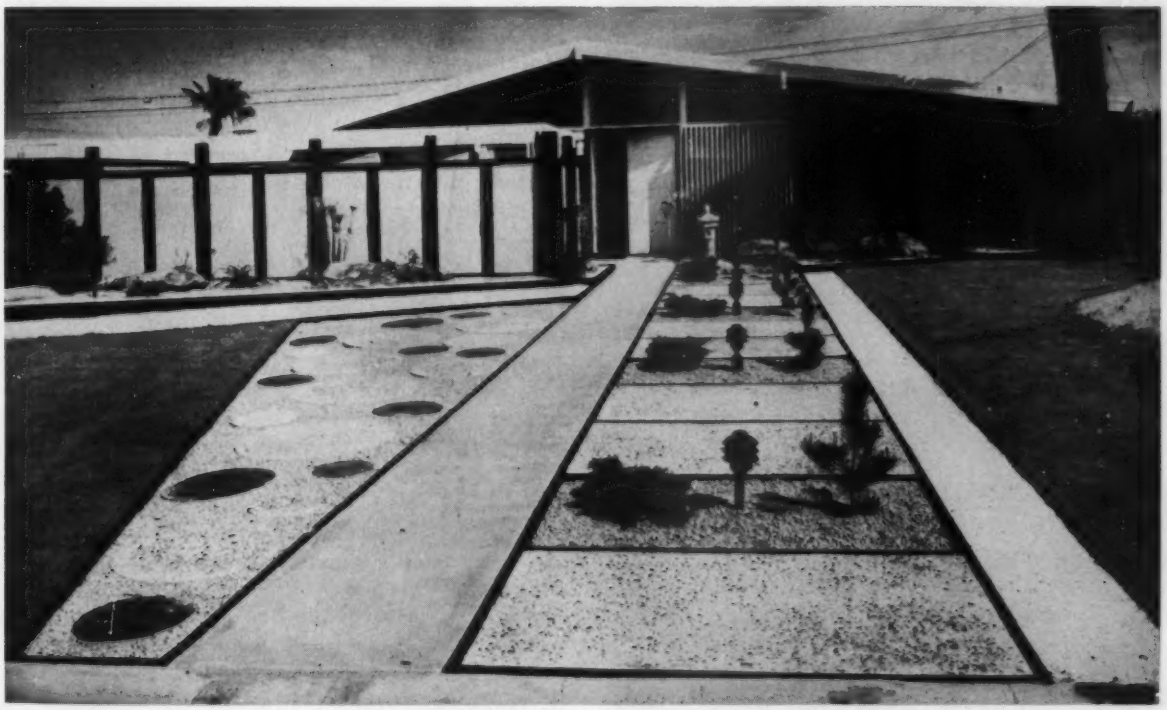
Whatever technique is used, however, certain facts must be kept in mind when pigments are used to color concrete. Texture will have an important bearing on the apparent shade. The same mix partly cast against a glossy plastic form liner and partly given a rough finish will present two quite different appearances. The coloring of aggregates will affect the final shade appreciably. Curing also plays an important role in this respect. The entire area should be thoroughly and uniformly cured to assure not only a constant shade but also a long lasting one. A colored concrete surface will perform much better if it is regularly and heavily coated with a high grade wax. This is most important when foot or vehicular traffic is expected.

Clearer, more brilliant colors will be achieved with white cement and light colored aggregates, especially in pastel shades. Be careful of the amount of pigment used, especially lampblack, because excessively high quantities will undermine the quality of the concrete. Always make test batches in this work; so many factors affect the final appearance of the concrete that this is the only dependable way of deciding quantities and techniques.

exposed aggregate

Exposing decorative aggregates in the surface of concrete, while not a new development, has gained great popularity recently in the move toward more colorful structures. By means of exposing aggregates it is possible to predict more accurately what the finished product will look like and the colors are usually longer lasting. Although higher in cost than some other techniques, its beauty and durability are persuasive selling arguments.

The availability of a wide choice of colors is another important advantage of exposing aggregates. Decorative aggregates commonly used include marble, quartz, granite, tiles and ceramic



Color in the concrete adjacent to this Palm Springs, California, residence was obtained in two ways. In the cast-in-place sidewalk, colored ready mixed concrete was used. In the precast circular sections and in the cast-in-place rectangles shown on either side of the walk, the effect was achieved by exposing aggregates of various colors on the surface of the concrete. Thorough and uniform curing is especially important in producing colored concrete.

and vitreous materials. Marble is readily available and relatively low in cost. Also, it comes in a number of colors—red, pink, yellow, green, gray, blue, black and white. Blue and yellow marbles are available only in pastel shades but the other colors range from pastel to dark hues.

Quartz is an extremely durable, hard material; it has a hardness approximately that of carbon steel. Quartz is available as a transparent type or in a milky white or a light pink. The transparent variety comes in handy when the matrix is pigmented to the desired color and it is to be used to add sparkle and durability to the surface. The hardness of quartz renders it somewhat more difficult to quarry; and therefore it is a little higher in cost than marble. (Costs vary greatly due to the influence of shipping charges).

Granite is quarried in various shades of pink, gray, black and white. It is nearly as hard as quartz; and it is extremely durable.

Many tiles are now available that can be cast in concrete surfaces. They come in a number of colors and designs and are usually glued face down to a paper or cloth backing. Ceramic and vitreous materials offer the most dramatic, vibrant coloring available. Ceramic materials are three to five times as expensive as marble and uncrushed vitreous materials cost 10 to 12 times as much as marble.

For thin concrete sections, as well as for those using inexpensive aggregates, the entire thickness is sometimes cast with a mix using the decorative aggregates. This is especially popular if both sides of the slab are to have an exposed aggregate surface. This simplifies construction and is a fast technique. Often, however, the cost of the materials involved—white cement and a high priced aggregate—make this impractical. Several casting methods have been devised to get around this difficulty.

A two-course panel can be used. First, a backup layer is cast of sufficient thickness to take care of the insulating and structural requirements. Then, either before or after it has cured, a second layer—this one only one inch thick—containing the decorative mix is cast on top of it. Frequently this technique is reversed and the one inch decorative course is placed first.

If a pattern is desired it can be delineated by thin divider strips on the bottom of the form. A thin layer of retarder is then applied and decorative aggregates of the appropriate color are placed in the areas outlined. The wooden strips are removed, a one-inch white or colored mix is cast and afterwards backed up with a normal gray mix. When the panel has hardened, the face is vigorously brushed to remove the surface cement paste, the set of which was retarded. This reveals the aggregate to obtain optimum color.

These techniques are mainly for precast work but a means has been developed to expose selected aggregates in the surface of vertical cast-in-place concrete. It is called aggregate transfer. In this type of construction form liners are used. The thin plywood liners are coated with an adhesive and decorative aggregates are positioned on it. After the adhesive has hardened, the liners are fastened inside the forms and concrete is carefully cast against them. Since the bond of the aggregates is greater to the concrete than to the adhesive, they are "transferred" to the face of the concrete when the liners are stripped.*

A simple method for exposing decorative aggregates in horizontal cast-in-place surfaces is a scattering or broadcasting technique. In this approach, the floor, driveway or sidewalk is cast in the usual manner or as a two-course slab with a white or colored topping. After the concrete has hardened sufficiently to support a man and leave only slight heel indentations, the decorative aggregate is broadcast over the surface of the slab. The aggregate must be applied thickly and evenly to avoid any spotty effect. The surface is then lightly rolled to assure a good bond of the aggregate with the concrete. Extra aggregates are then applied in spots that appear insufficiently covered. As might be surmised, only small areas should be cast at any given time when using this method. A good method to follow is to set up joints and then cast alternate panels. This technique is economical since it is simple and rapid and because only a minimum amount of decorative aggregate is necessary. Its drawbacks are that it is difficult to get an even covering of aggregates and that considerable experience is needed to know the critical time at which the aggregates should be broadcast over the surface.

*For more data on aggregate transfer, see "Color and Texture in Concrete Surfaces," Concrete Construction Magazine, November 1956.

Next month, Part II of this article will describe the various techniques for adding color to hardened concrete, including a discussion of paints, stains, plaster, and stucco.

Readers who would like to have additional information on the subject of integral color in concrete may request it by circling No. 443 on one of the reader service cards in this issue.

Most concrete construction needs are readily met with Type I or II cement, but there's a wide variety of other types to meet particular requirements.

CEMENTS ON PARADE

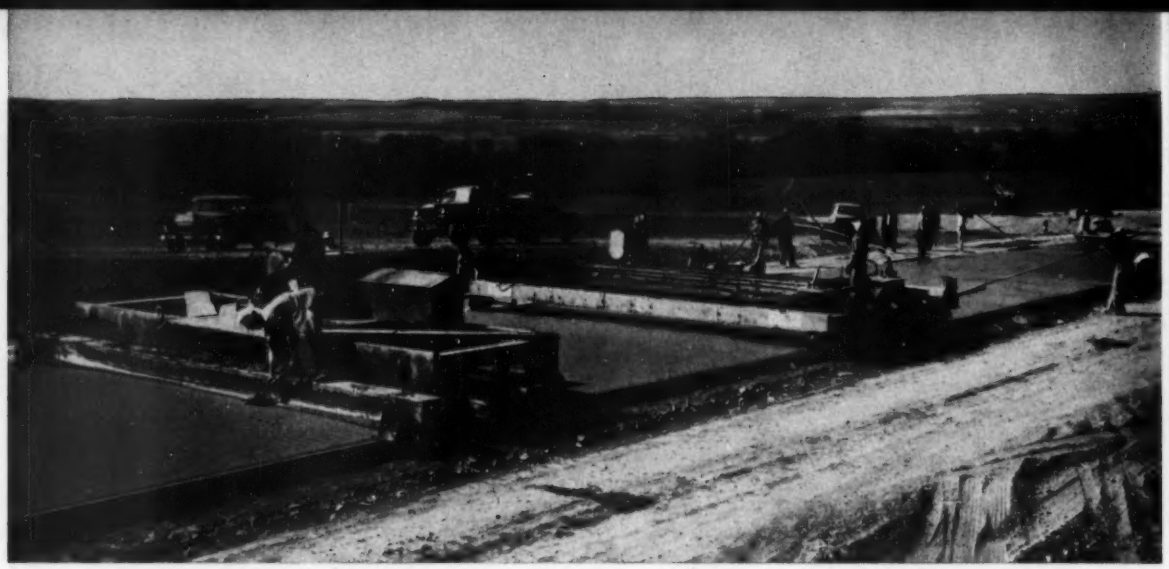
MUCH HAS BEEN WRITTEN praising the versatility of concrete as a material of construction. Practically every kind of construction known makes use of concrete. Even buildings considered to be entirely of steel, brick or wood make extensive use of concrete for fireproofing, foundations, mortar and floors. Since concrete is used for such widely contrasting purposes, it is only natural that there has developed a need for types of cement especially adapted to specific applications. The use of various raw materials in the manufacture of cement has introduced still other type variations, such as portland blast furnace slag cement and natural cement.

As would be expected, Type I and Type II cements account for the bulk of production—94 percent of the portland cement made in this country and well over ten times all other types put together (all figures for 1958). Of the 168 cement manufacturing plants operating in the United States, 167 produced these two types. Although the remaining varieties do not constitute a great percentage of production, they do fill definite needs and are certainly worth knowing about.

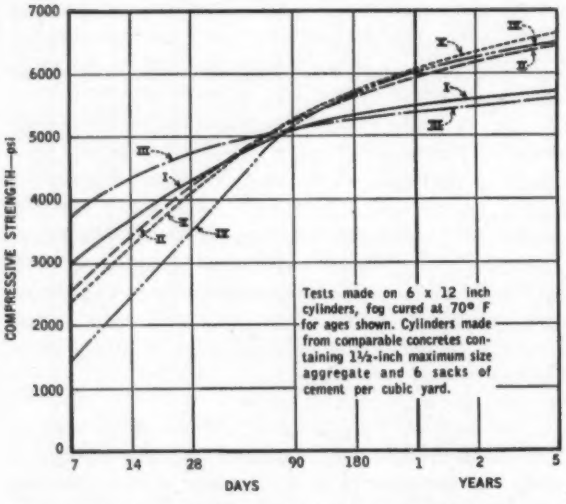
Air-entraining counterparts of Type I, Type II, Type III, portland blast furnace slag and portland-pozzolan cements are provided for in specifications of the American Society for Testing Materials (by which the overwhelming bulk of American cement production is governed). The designation for an air-entraining cement is obtained by adding an "A" to the standard abbreviation; for example, ISA indicates air-entraining portland blast furnace slag cement. These cements produce 18 ±3 percent air in a standard mortar. The amount of air contained in concrete made with these cements would depend upon such factors as aggregate size and gradation.

Type I (IA) cement is the backbone of the American cement industry. Type I portland cement production each year amounts to several times the production of all other types combined. It is used wherever the special characteristics of the other cements are not needed. This means that it is the right cement for very nearly all construction in most parts of the country. Ready mixed concrete is usually batched with Type I unless some other type is specified.

This residential basement foundation of cast-in-place concrete is a typical example of the many types of construction for which Type I portland cement is ideally suited. Most ready mixed concrete is batched with this type of cement. Types I and II cement together account for well over 90 percent of total production.



This Interstate System paving job was performed with concrete containing Type II cement and an air-entraining agent. It is made to somewhat closer tolerances than Type I, has greater resistance to sulfate attack, lower permeability, less tendency to bleed, and less heat of hydration. It is also ground somewhat finer than Type I cement.



This graph, from the Concrete Manual of the Bureau of Reclamation, shows comparative strength development of concretes made and cured under similar conditions for the five types of portland cement.

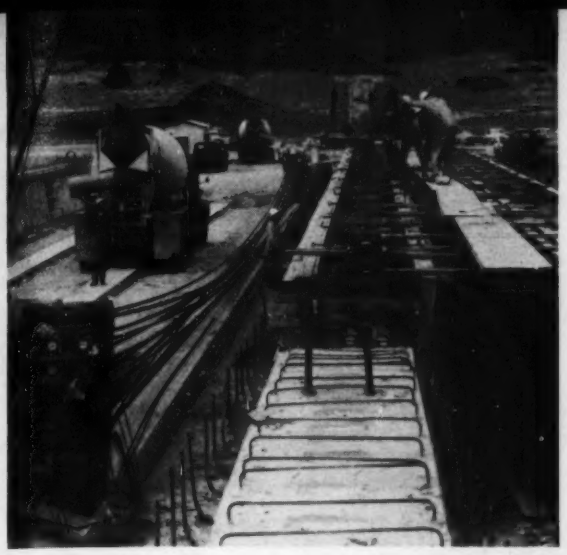
Type II (IIA) cement is similar in application to Type I but it is manufactured to somewhat closer tolerances and offers (1) greater resistance to sulfate attack; (2) somewhat less heat of hydration; (3) lower permeability; and (4) less tendency to bleed. It is ground finer than Type I and varies slightly in chemical composition from it. Its strength is less than Type I until approximately 30 days after casting, after which Type II forges into the lead. It will be noted that the graph indicates that the slower a cement hydrates, the greater will be its long-time strength (six months or more).

Type III (IIIA) cement is usually referred to as high early strength cement. It gains strength during the first month at a considerably faster rate than other cements because it is ground finer and has an altered chemical composition. Curing periods for concrete made with Type III cement can be shortened to release forms earlier and permit faster tensioning of strands in prestressing work. Since its rate of hydration is considerably faster than other types (excepting high-alumina cements), a greater amount of heat is generated; at three days total heat generated is more than twice that of Type IV or Type V. As might be expected from the general relationship of hydration-rate to strength-gain, Type III develops the lowest long-time strength of the major five types of cement.

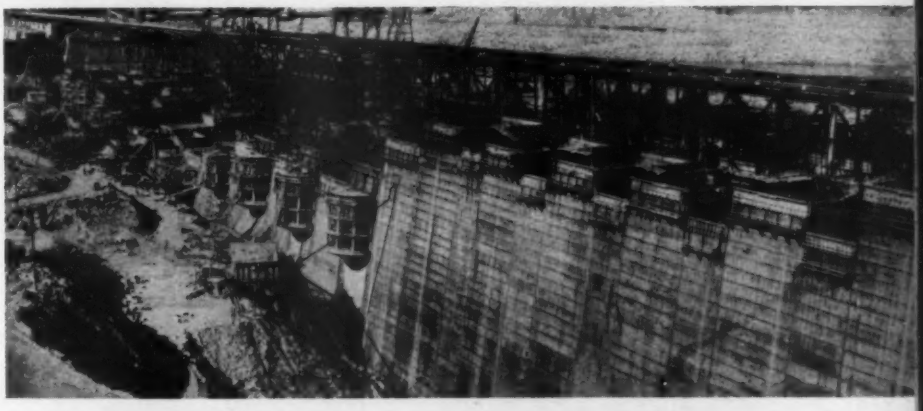
Type IV cement is used almost exclusively in mass concrete, such as dams. Its very low rate of generating heat of hydration helps prevent the cracks resulting from the high internal temperatures which develop with ordinary cements. It is not ordinarily stocked by cement plants; it is made to order for special projects, usually according to federal specifications. Little is manufactured in this country—in 1955 no Type IV cement was made in the United States.

Type V cement is high sulfate resistant cement and finds favor in areas afflicted with the problem of sulfate soils which attack ordinary concrete From 1956 to 1958 production of Type V cement increased over 150 percent. Like Type IV, it gains strength slowly and generates less heat than other types. Studies have shown that Type V cement develops the greatest long-time strength of the common types of cements. However, since it does gain strength slowly, it must be protected and cured longer than Type I.

MORE



A typical use of Type III cement is shown here in the site casting of prestressed concrete girders for a highway bridge. This type of cement differs from others chiefly in its property of attaining much higher early strengths, thus in the application shown permitting earlier stripping and re-use of expensive forms.



Type IV cement, which has the characteristic of generating heat of hydration at a very low rate, is used mainly for massive concrete structures, such as the Grand Coulee dam pictured here. This type of cement is generally manufactured to order for specific projects.

Type V cement is used when high resistance to sulfate attack is desired, as in the retaining walls of this elaborate interchange on the West Coast. This type of cement gains strength slowly and generates less heat than other types. It must be protected and cured longer than Type I cement.

This light-reflecting dividing strip on a major highway is an example of effective use of white portland cement. White cement costs substantially more than Type I cement, since the raw materials used in it are not widely available, but the demand for it shows a steady increase as more and more architects are becoming aware of the striking effects which can be achieved.

In addition to the five basic types of cement just described, there is a variety of others that have interesting applications.

White cement has found increasing favor as architects have learned to take advantage of the beauty of exposed concrete. It is used for such applications as white or colored walls, exposed aggregate work and highway separation lanes. The manufacture of white cement is a highly exacting task and requires special raw materials. Since iron content must be limited to an unusually low figure, clay and limestone of exceptional purity must be used. Not all plants have such raw materials available. (Of the 168 plants manufacturing cement in 1958, only 4 produced white cement). As a result, the price of white cement is the highest of all types commonly used, usually amounting to twice that of Type I. But the beauty and special effects possible with white cement often overweigh its greater cost.

Portland blast furnace slag cement (IS and ISA) is the outcome of research by the steel industry aimed at creating new markets for its byproducts. Its strength requirements are the same as for Type I and, therefore, it can also be used for all general construction not exposed to sulfate action.

Slag cement is a combination of Type I clinker and granulated blast furnace slag. ASTM specifications permit addition of up to 65 percent of slag, but the slag content is most often in the 25 to 50 percent range as governed by strength requirements.

Portland-pozzolan cement (IP and IPA) is intended for general construction usage, but tests indicate that it does not develop early strengths as great as Type I. Because it develops less heat of hydration, it has upon occasion been used for mass concrete construction as is Type IV. Very little portland-pozzolan cement is manufactured in this country.

Natural cement accounts for less than one percent of the cement made in the United States. However, a small quantity is used in the northeastern part of the country. It is generally mixed with a portland cement and used for general construction, especially in masonry cement work.

Masonry cements (both gray and white) vary greatly in chemical composition, but most are a combination of portland cement or portland blast furnace slag cement with a burned lime, combined in many cases with an air-entraining agent, gypsum to control setting time and a water repellent. Masonry cements are used to form the mortar for bonding together brick or concrete masonry units. They must provide a mortar that is dimensionally stable and which bonds well with building units.

Oil-well cements were developed for concretes used to seal oil and gas wells. This material, which is subjected to temperatures up to 175 degrees centigrade and pressures up to 18,000 psi, must remain fluid up to four hours and then harden rapidly. These cements are generally available only near oil field areas.

Expanding cements were developed in France to prevent the shrinkage which takes place when ordinary concrete dries. In recent years there has also been considerable experimentation in the United States and Russia on the use of such cements to produce prestressed products. Expanding cements are a combination of 70 percent portland cement clinker, 20 percent blast furnace slag and 10 percent calcium sulfoaluminate cement. Abundant water is provided until 99 percent of the desired expansion is reached, whereupon the water supply is cut off and only one percent further expansion occurs. Although close control can be obtained under laboratory conditions, field use has been largely unsuccessful.

High-alumina cements contain a much higher percentage of alumina than portland cements. Bauxite (an impure hydrated alumina) is added to the limestone in the manufacture of this cement. Concrete made with high-alumina cement hardens very rapidly and reaches its maximum strength in 24 hours. Its greatest use is in refractory work and in patching floors where interruption of traffic must be held to a minimum.

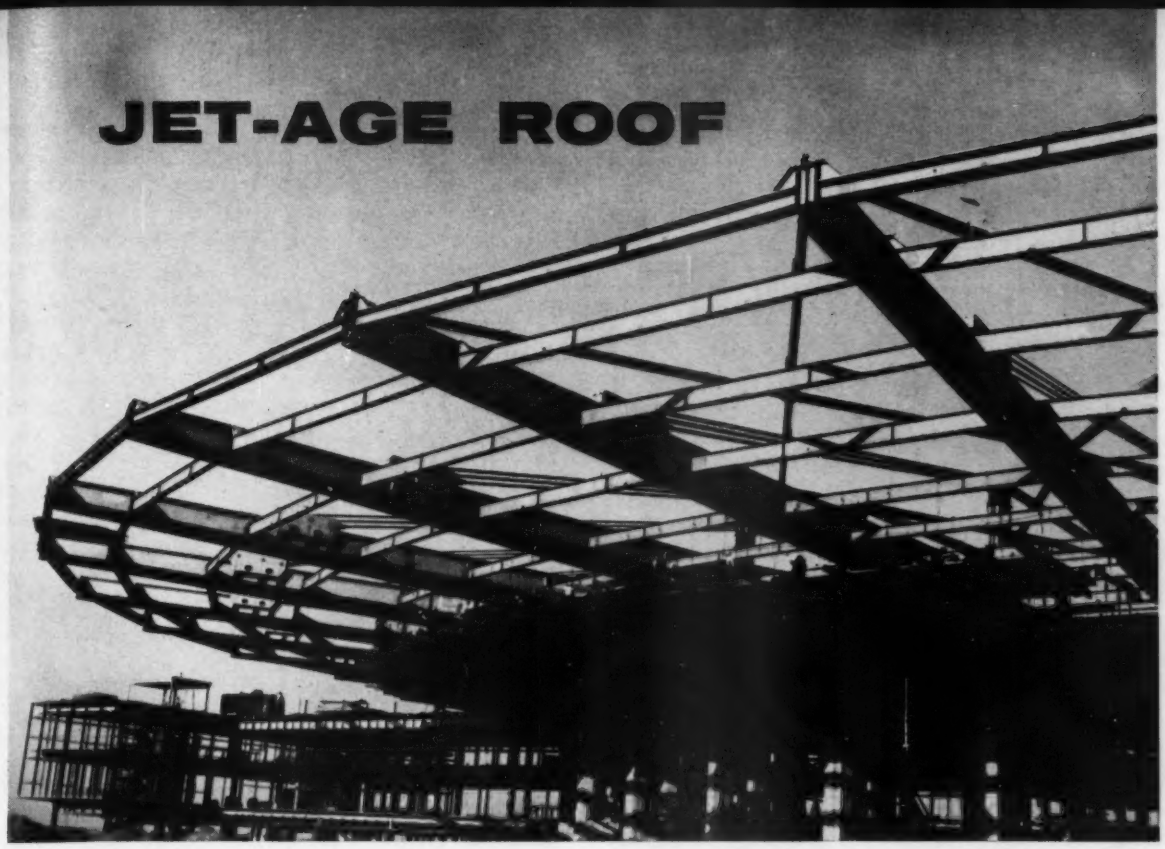
Plastic cements are a combination of Type IA cement and a plasticizing agent. They find their greatest popularity on the West coast where they are used for general construction.

Waterproof cements are Type I or Type IA cements with a small amount of waterproofing agent added. They are used for construction subject to hydrostatic loads, such as basement walls and liquid storage tanks.

Strontium and barium cements are those in which the calcium is completely or partially replaced by either strontium or barium. Concrete made with barium cement shows a marked improvement in resistance to the action of sea water and sulfate solutions and can withstand higher temperatures than those made with ordinary cements. These cements are believed to be particularly valuable for use in concrete shielding for equipment emitting dangerous rays from atomic fission devices.

This roundup of cements is admittedly not all inclusive. There are other types and there are more variations of the several types of cement discussed here (for example, federal specifications cover eight types of portland blast furnace slag cement). But for the moment, at least, the descriptions above cover virtually all the types of cement that American contractors and engineers are likely to require. END

JET-AGE ROOF



Spoke-like steel girders, reinforced by cables which pass over stanchions mounted directly over concrete piers, support the concrete roof for this new jet plane terminal at New York International Airport. Falsework for forming is here shown being suspended from the steel preparatory to casting the lightweight structural concrete roof.

Huge airport canopy takes advantage of several weight-saving techniques to reduce slab dead load.

ONE OF THE DISTINCTIVE FEATURES of the Pan American World Airways passenger terminal, now under construction at New York International Airport, is its immense saucer-like roof. Over four acres in area, and large enough to cover Yankee Stadium, it hovers gracefully over the central terminal structure and extends out to protect jet planes and passengers from the weather.

Basically, the elliptical-shaped roof is like a huge wagon wheel with 32 spokes. The hub is fixed by a central anchorage, but the actual support of the spokes is a series of heavy piers midway out to the rim.

Cantilevering 114 feet beyond these piers, the canopy portion of the roof, capable of sheltering 6 jet liners at once, is framed into the 32 spokes. These spokes are welded steel girders each reinforced with 6 heavy cables which pass over a stanchion mounted on the girder directly over the supporting pier underneath.

Borrowing from suspension bridge principles, the designers have achieved a gracefully upward soaring roof line somehow suggestive of the jet age itself. As an adjunct to the cantilevered wagon wheel concept, fresh thinking was also applied to the problem of roof and ceiling construction. Two requirements were paramount here: holding roof weight to the minimum (with accompanying savings in supporting structure and foundations); and achievement of sound absorption along with decorative potential.

The first condition was met largely through the use of welded wire fabric for reinforcement of the 4-inch thick lightweight concrete slabs between the radial girders of the roof. A reduction in weight of reinforcement of about 20 percent was realized by the use of fabric, due to its allowable tensile unit stress of 24,000 psi, compared to the 20,000 permitted for reinforcing bars.

Other design provisions which effected dead load reductions included use of lightweight aggregate concrete weighing 100 pounds per cubic foot and the specification of an acoustical cellular glass insulation in 3-inch thick blocks as the ceiling material. This material weighs only 2 pounds a square foot, is highly effective in reducing sound levels and is attractive when painted.

MORE

Lathers cut out sheet of welded wire fabric to fit around drain in roof structure. Fabric rests on flange of purlin, drapes down to rest on inch-high chairs on cellular glass block, which has been coated with a layer of asphalt mastic waterproofing adhesive. Note lapping of fabric sheets (left) to assure continuity of reinforcing. Suspension cables passing over rockers atop the stanchion are anchored at center of building.

In this view the 4-inch thick concrete slab has been placed over glass block and wire reinforcement, and finishers are at work. Note use of horizontal shoring to support runways (left).

Basic to the subsequent smooth progress of the job was the decision to suspend from the roof reusable falsework for all the roof construction and to hang all formwork for the concrete roof slabs. The falsework was made up of sections approximately ten feet square, usually a dozen or more planks nailed to two heavy timbers. With manual winches at all four corners, the workers then hoisted themselves up on the section to the desired elevation, and tied the section in.

Enough falsework was made up to work on 18 bays of the roof at once, and, as work progressed around the elliptical wagon wheel, sections were removed from the far end and hoisted up to join the forward end of the work.

With the falsework in place, the carpenters then placed the formwork for the roof slab from underneath, the entire formwork system being supported by hangers from the radial girders and purlins which brace and stiffen the roof framework. Fifteen sets of forms, enough for nearly half of the 32 wedge-shaped bays in the roof, enabled work on top to proceed in sequence without any waiting. After concrete in a bay had set and cured, formwork was stripped and leap-frogged ahead to the forward end of the job, following up on the newly placed falsework.

Operations on top followed this sequence: the first step was to pour the concrete encasement of the radial girders (or spokes of the wheel), formed previously from below, and into which had been placed bar reinforcing, pigtailed out for later tying in to the roof slab. Then, on the newly placed plywood forms, workers laid 12- by 18-inch blocks of the 3-inch thick cellular glass insulation, with the blocks tightly against each other and completely covering the area of the roof slab between girders and purlins. Over this roofers then applied a coat of asphalt mastic waterproofing adhesive.

Next, the lather crew moved onto the job, first placing 1-inch high chairs, and then laying in sheets of welded wire fabric. The sheets were generally 10 feet wide and up to 16 feet long, the distance between purlins in the outer portions of the wedge shaped bays.

The final step in construction was placing the 4-inch thick lightweight concrete slab. The ready mixed concrete was hoisted up at the central anchorage of the structure, and distributed by Georgia buggies over runways laid across the radial girders, purlins, and temporary horizontal shoring. Over 4000 cubic yards of ready mixed concrete went into the roof slab. END

REDUCING JOB CONTRACT TROUBLES

Some concise suggestions to help the contractor with the knotty problem of job contracts!

JOB CONTRACT TROUBLES will undoubtedly forever plague the contractor. With some careful planning, however, he may reduce them considerably. The following points should be kept in mind by every contractor as he plans for a job.

1. Get it in writing. The contractor who depends on oral agreements is always loaded with contract troubles. No matter how small the job, the contract should be in writing. Every possible detail must be included in the contract to insure coverage of all procedures involved in the particular job.

2. Define "extra" in advance. It should be clearly understood by the customer that any item not covered by the contract is an extra and is to be charged for. If the contractor fails to make a charge for every item outside the contract he will soon find his profit for the job dwindling.

3. Spell out all details. Short, generalized contract forms should be avoided. Where any complicated work is involved the details should be included in the contract in language clearly understandable to the customer.

4. Specify materials to be used. Many legal tangles with regard to contract have arisen over misunderstandings on this point. Materials should never be specified in general terms or left unspecified. If exact colors, grade and manufacturer's name are specified within the contract, then this cause of possible dispute is avoided. The customer must understand this provision also.

5. State payment terms explicitly. The contract will usually be held binding in court should an appearance there become necessary to enforce payment.

MORE

The customer should of course understand the payment terms before he signs. A thorough understanding of terms by both parties usually prevents the necessity for legal action.

6. State time elements. Whenever possible, the date on which the job will be started should be stated. If, due to work backlogs, a definite date cannot be set, it is well to use a generalized term, e. g., "within sixty days of the signing of this contract." Exact completion dates are best avoided when possible since many elements outside the contractor's control may affect the work schedule. If the customer requires a completion date, here again generalized terms are to be preferred.

7. Don't guarantee uncertain materials. If the customer insists on using inferior materials in order to hold costs down, by all means insert a clause in the contract stating that materials are specified by the customer and that the responsibility for their performance is his own. This will of course serve to discourage insistence on inferior materials.

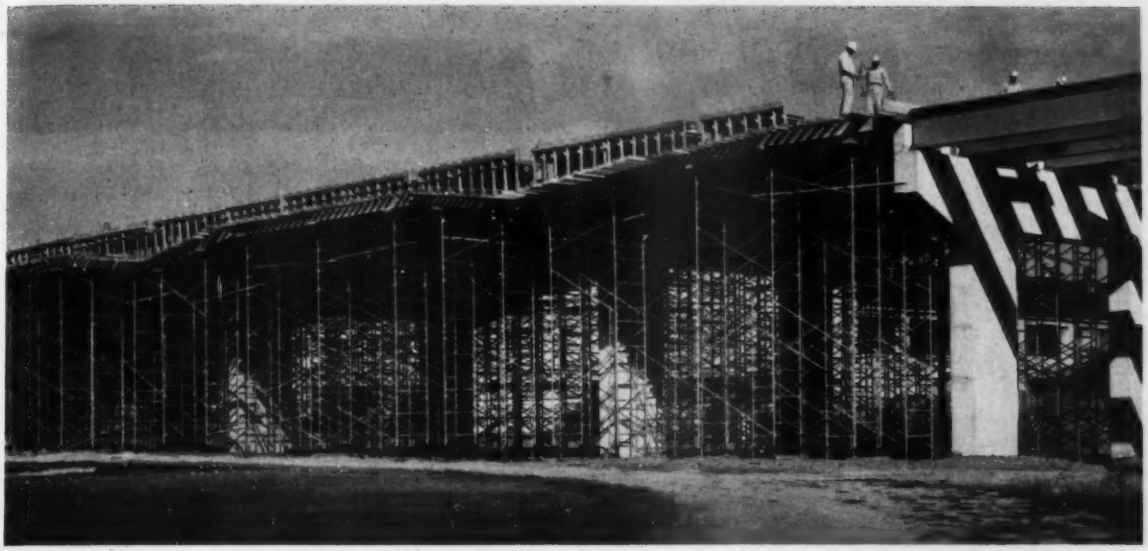
8. Avoid follow-up guarantees. Opinions vary greatly from one individual to another on what constitutes a perfect job. Therefore guarantees of "complete satisfaction" can be dangerous to the contractor.

9. Set time limits within the contract. No matter how good the materials used, or how well the job is done, no indefinite performance guarantee should be made. It is best procedure to limit these guarantees, if they must be included, to periods indicated by past experience to be practical.

10. Insert an "in case of dispute" clause. Provide for a method of handling any disagreement with regard to completion of the contract or the job as part of the contract. It may save a costly trip to court later on.

11. Include liability disclaimers. All job hazards not covered by insurance need to be mentioned in the contract. It is preferable to disclaim all such liabilities.

12. Check in detail with the customer one more time. The contract in its final form should be presented to the customer and every point clarified to him. His complete attention and understanding before signing are a must. Then give him a day or two before starting the job to re-read the contract and to come up with any last minute ideas for changes. It is easier to re-write the contract before the job itself is started than to make contract revisions or set up oral side agreements during the job. **END**



HEAVY LOADS imposed by overpass on West Coast street location project are safely supported by new PS Co. Heavy Duty Shoring frames.

New Frames Carry Heavy Shoring Loads

HEAVY DUTY "Trouble Saver" Shoring, employing a 4'-wide frame of new design, is ideal for the special conditions and heavy loads often found in present-day construction.

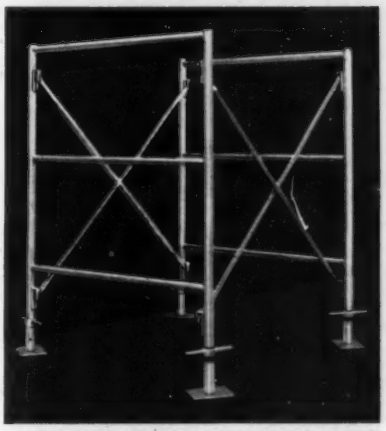
Designed in accordance with PS Co.'s high standards of safety, the frames were tested under simulated field conditions to safely support loads up to 10,000 pounds per leg. The system used for these exhaustive tests and the factor of safety used in arriving at safe leg loads are identical with those used for many years in testing standard "Trouble Saver" Shoring, so widely used throughout the country.

The new frames are manufactured in 3', 4', 5' and 6' heights. Pivoted diagonal braces provide spacings from 3' to 10'. A full line of accessories is available.

Heavy Duty "Trouble Saver" Shoring guarantees contractors the same money-saving advantages as found in standard "Trouble Saver" equipment:

FREE-STANDING SECTIONS
EASE OF ERECTION
LUMBER ECONOMY
QUICKLY ADJUSTABLE
BUILT-IN-SCAFFOLD FOR FORMING & STRIPPING
ROLLING SHORING-FORMWORK
ENGINEERED LAYOUTS

In addition to Heavy Duty Shoring, PS Co. has wide experience in all types of steel shoring. Because of this, PS Co. recognizes that no one type is best for all applications. For example, standard "Trouble Saver" Sectional Shoring meets the great majority of requirements of routine construction. For special, heavy duty requirements, new



FREE-STANDING basic section of "Trouble Saver" Heavy Duty Shoring frames. Fast acting, patented "SlideLoks" secure braces to frames.

"Trouble Saver" Heavy Duty Shoring is the answer. For extreme loads up to 40,000 pounds on each leg, PS Co.'s Extra Heavy Duty Shoring, has been used successfully by contractors.

Obviously, any shoring loads or any special conditions are no problem with PS Co.'s complete line of steel shoring equipment.

For further information on new Heavy Duty "Trouble Saver" Shoring or on any PS Co. Shoring system, call your nearest PS Co. office.

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Complete scaffolding equipment and engineering service offered through nation-wide sales offices or representatives. Look under Patent Scaffolding in the Yellow Pages for your nearest source.

SALES **RENTALS**

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ALPHA

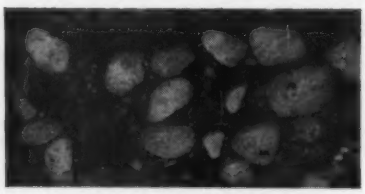
BETTER CONSTRUCTION THROUGH BETTER USE OF CEMENTS

news and notes from the field

Dusting Concrete Floors—Causes and Preventions

When a concrete floor dusts it is because the wearing surface is weak and traffic has caused it to become powdery. The wearing surface of a concrete floor is comparatively thin in cross section, and its construction must be controlled by certain basic principles. When properly constructed this top surface will resist extremely severe wear and abrasion indefinitely, and dusting will not occur.

UNIFORM DISTRIBUTION of coarse aggregate particles in correctly built concrete floor. Note that aggregate extends right up to wearing surface.



WEAK WEARING-SURFACE shows low strength layer of fines. Overtroweling has caused fine particles to rise to the top. Result is excessive shrinkage, cracking and dusting.

What Causes Dusting?

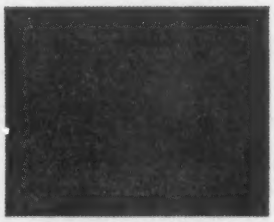
Weak surfaces and dusting generally result from the use of overly wet mixes, excessive troweling and/or inadequate curing which allows rapid evaporation of mixing water at the surface.

To confirm the fact that these practices actually cause dusting, an experienced finisher was called into the laboratory at one of the Alpha plants. He was asked to construct two slabs using the same concrete mix for each, but the slump, finishing and curing of the two slabs were to be drastically different.

More Information

Write for a copy of the Alpha Craftsmanship in Concrete Folder: Steel Trowel Finishing. Consult with your Alpha representative on any unusual problem.

Sample A



Curing and finishing of this slab conformed to the recommendations for proper construction that follow. Sample A had a smooth, hard surface which did not dust.

Sample B

In sample B water was added to increase the slump to 7 inches. It was troweled excessively and not properly cured. Sample B had a soft surface which was easily scratched with a nail as shown in the above illustration.

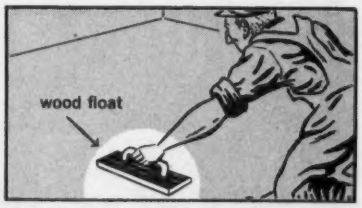
Since the cement and aggregates for each sample were identical, and each slab subjected to the same weather conditions, this Alpha experiment shows conclusively that the wetter mix, overtroweling and inadequate curing definitely produced the extreme difference in results.

How to Build Heavy-Duty Concrete Floors

1. Use a relatively dry mix, not over 4-inch slump, on a *damp* subgrade. For machine floating, water should not exceed 4 gal. per sack of cement; for hand floating not more than 5 gal. per sack of cement.

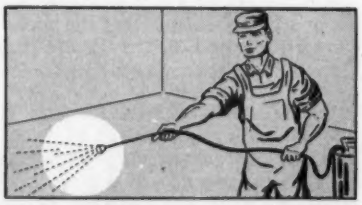
2. Compact by tamping, rolling or vibrating. If vibration is used, it should be uniformly applied and slump should not exceed one inch.

3. Strike off and wood float to grade immediately. If necessary, use steel trowel sparingly to remove float marks. Avoid excessive troweling!



4. Where an extremely smooth surface is desired, an intermediate troweling may be used with great care immediately after the water sheen leaves the surface.

5. Give final steel troweling when finger pressure just dents the surface. The trowel will then produce a ringing sound. Use enough finishers to handle the concrete when ready.



6. Cure with waterproof paper, membrane curing compounds, wet burlap or by ponding with water. Start curing as soon as possible.

Do not omit any of the above steps. Often small imperfections in fresh concrete surfaces do not show after the concrete is cured; so excessive troweling is unnecessary.

These recommendations are intended for use in finishing horizontal surfaces of non air-entrained concrete. When air-entrained concrete is used, slightly different techniques may be required in steel troweling to prevent pulling or tearing the concrete surface.

Maginniss motor-in-head concrete vibrators—best for every job!

Use the right tool...

Skilled mechanics are careful to use the tool best suited for the job at hand. Profit-conscious contractors, too, use equal care when selecting concrete vibrating equipment.

And, because Maginniss builds both Hi-lectric induction motor-in-head vibrators for heavy work and Uni-lectric series motor-in-head vibrators for light work, you can choose the vibrating tool best suited for your construction jobs—large or small!

For better concrete . . . higher production . . . lower costs, see your Maginniss distributor. He'll recommend the Maginniss motor-in-head vibrator exactly right for your needs.

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HI-LECTRIC vibrators, featuring powerful induction motor-in-head design, are ideal for continuous use in heaviest service. Use them on bridges, culverts, heavy structures of all types and on paving jobs.

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Sinews of steel
to strengthen concrete construction

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For years, CF&I has worked closely with the construction industry, developing strong welded steel mesh for reinforcing purposes. The result: CF&I-Clinton Welded Wire Fabric.

This rugged mesh gives concrete structures—from bridges and roads to culverts and skyscrapers—maximum strength and durability. Its dependability stems from the high quality of the steel wire used.

CF&I-Clinton Welded Wire Fabric is manufactured to all ASTM specifications and is furnished in either rolls or mats. It is supplied in a wide range of gages and spacings. For complete information, call our nearest sales office.

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HANK MYERS

concrete contractors elect new officers

Mr. Henry Myers of Chicago w elected president of the Natio Concrete Contractors Associati during the Association's rece convention in Philadelphia. M Myers, who is a partner in Char A. Myers and Sons, a concr construction company, succee *Mr. Bert Carey*, president of B Carey and Company. Mr. Ca was honored by being named ex-officio member of the Boa of Directors for life.

Also elected were *E. Ray Fr man*, Dallas, Texas, 1st vice pre dent; *Philipp Hoerr*, Peoria, I nois, 2nd vice president; *H. Bjornsen*, Cedar Rapids, Io 3rd vice president; *Troy Paul* Charleston, West Virginia, sec tary; and *William DeGraf*, C cago, Illinois, treasurer. Also serve on the Board of Direct are *Robert Burns*, Dallas, Tex *Elbert F. Lewis*, Greensbo North Carolina; *Roger Corbet* New York City; *Carl Nardu* Akron, Ohio; *Mike Savoea*, Akr Ohio; *William S. Hodges*, Mus gon Heights, Michigan; *Al Yost*, Sterling, Colorado; a *Harold Allen*, Dayton, Ohio.

The Association voted to p vide associate memberships a to promote a membership dri Six papers were presented authorities in the concrete co struction field and a trade sh was held in connection with t convention.

How to Stretch a Buck... Use

Symons Steel-Ply Forms

Your investment in forms can pay off in extra dollars saved when you use Symons Steel-Ply Forms. It's because Symons Steel-Plys are designed and built with performance features that cannot be found in other forms.

Completely Interchangeable

Any combination can be used . . . side by side or one on top of the other, for any length or height of wall. Panels can be removed and replaced at any point . . . this simplifies erecting and stripping.

Weight 5 Lbs. Per Square Foot

When considering forms, the weight of the form is an all-important consideration. Because of the efficient methods developed for erecting and stripping forms, handling is an important part of the labor cost. Symons Steel-Ply Form weight of 5 lbs. per square foot means a significant cut in form labor costs. Handling costs are also reduced because all Symons Steel-Plys are equipped with handles for easier and faster handling.

Ties To Fit The Job

With Symons Steel-Ply Forms you can get the tie that will be most economical for your particular job. For rough work where appearance and break-back are not important you can use the Symons flat tie. When clean-cut foundations and easy positive break-back are required, Symons Steel Rod Ties with 1" break-back are the answer. And, for special gang forming, Symons She-Bolt Ties with 1½" break-back are available.

37,000 square feet of steel-ply forms used on the Air Force Academy, Colorado Springs, Colorado.

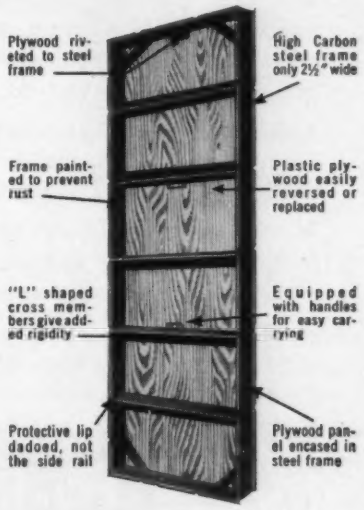
CIRCULAR WALLS were formed by ganging steel-ply forms. Four ganged sections 22' wide by 28' high were used to pour a third of the sewage treatment tank at one time.

Connecting Bolt and Wedge

For connecting hardware a bolt and wedge are used. With these two pieces you can fasten two forms together and insert the tie faster than driving a nail. Brace plates, scaffold brackets and waling hardware are also fastened with the bolt and wedge. This eliminates the need for dogs, nuts and bolts, lugs, vise grips, special tools, as well as complicated and expensive ties. The only tool needed is a hammer.

Adaptable For Every Type Construction

Contractors who use Symons Steel-Ply Forms can bid on almost any type concrete job. They are adaptable for straight, circular, battered, cut-up and "Y" walls. Try Symons Steel-Ply Forms on your next job; they can be rented with purchase option.



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books

Architectural Rendering — The Techniques of Contemporary Presentation. *By Albert O. Halse. Published by F. W. Dodge Corp., 119 W. 40th St., New York, N. Y. 277 pp. Illus. $15.75.*

This book is a masterful, major treatise which explains in text and illustrations every technique and medium used in rendering today. The various aspects of rendering — interiors, exteriors, nature; perspective, lighting, reflections, textures; all of the media in detail; how to buy materials, and how and when to use them; professional tricks of the trade—receive detailed attention. The author's aim has been to help the renderer find the style and medium best suited to his particular needs.

ACI Book of Standards. *Published by American Concrete Institute, P.O. Box 4754, Redford Station, Detroit 19, Michigan. 382 pp. $5.00.*

The 1959 edition of the ACI Book of Standards is the most recent compilation of current ACI standards, recommended practices, and specifications. Fifteen ACI standards are compiled under one cover, incorporating such subjects as building code requirements for reinforced concrete; winter concreting; hot weather concreting; selection of proper proportions for concrete; and the measuring, mixing and placing of concrete.

Other standards cover test procedure to determine relative bond value of reinforcing bars; evaluation of compression test results of field concrete; design and construction of concrete pavements and concrete bases; design and construction of reinforced concrete chimneys; application of portland cement paint to concrete surfaces; minimum requirements for precast concrete floor and roof units; application of mortar by pneumatic pressure.

On-site precasting saves $24 a foot on seawall

ASSEMBLY-LINE precasting of slabs and piles, on-site, reduced costs to $16 a linear foot for 11 miles of seawall built on the several islands of Golden Isles, Hallandale, Fla. This was a saving of $24 a foot compared with the previous method of casting these components in a central yard and transporting them to the site.

Specialized crews cast the slabs directly on the ground, in steel forms which were used twice a day. Piles were cast in 5-mold forms, in 12′ to 16′ lengths. A template of two 54′ beam sections was then anchored into place at the shoreline. This accommodated 6 piles and 5 slabs. Pilings were slipped into its slots and driven. A backhoe then made a cut for the 13′ tie rod between each piling and a concrete deadman, backfilled the trench, then picked up each slab by loops cast into the top and lowered it between two piles.

Capping crews then set the forms for casting the wall cap in place. These mass-production methods built to a peak of 200′ of finished seawall per day.

A total of 20,100 cu. yds. of 3,000 psi ready mixed concrete was used for the 9,450 pilings, slabs and caps. It was delivered by truck mixers of certified design, capacity, mixing speed and water control accuracy.

50 SLABS A DAY were poured where they were to be used. Paper strips at one end gave a smooth surface to take the forms for cast-in-place caps. Wood blocks at other end formed notches to fit with "T" of pilings. Top surface of slabs, designed to face waterway, was troweled smooth (see finished slabs at right).

STEEL BEAM template positioned the piles. Notched slabs fit into the T-shaped piles. Notches are sloped so weight of slabs "seals" the joint.

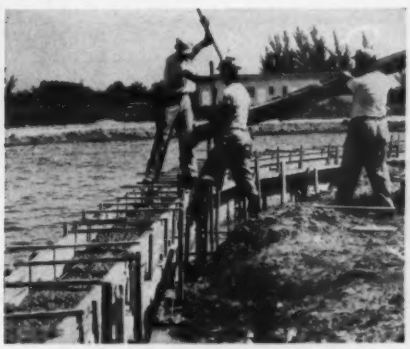
←

13′ TIE RODS fasten piles to buried 2′ x 2′ x 4″ concrete deadmen. Loops were cast into slabs for easy handling by backhoe.

→

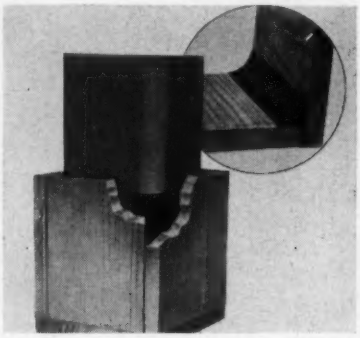
CASTING CAP IN-PLACE: Cap forms were 18″ x 6″; carried ⅜″ reinforcing rods.

Lyne, Inc., Hallandale, Fla., built and installed seawall.



products

For additional information circle matching key number on reader service card on page 104C.



corner former 428

This corner former is a specially designed, pre-molded, plastic material that produces a smooth, uninterrupted, rounded 1-inch radius corner to poured concrete. It can be easily installed on standard forms and is fully re-usable. Dangerous sharp edges are eliminated and the appearance of architectural concrete is enhanced. Servicised Products Corp., 6051 W. 65th St., Chicago, Ill.

forming catalog 429

A new 12-page catalog describes the latest design of a line of lifetime steel forms for concrete construction. Simple design of forms and clamp for locking together is said to save time, labor and material. Catalog also pictures various form set-ups for curved walls, tapered walls, tunnels, columns, corbels and offsets as well as simple walls, and gives complete specifications for forms, available on a purchase basis with return option. Accessories, supplies and tools are listed. Economy Forms Corp., Box 128-AF, H. P. Station, Des Moines, Iowa.

SIKA EPOXY SURFACE-KOTE

SIKA EPOXY CRACK SEALER

SIKA EPOXY COMPOUNDS

SIKA EPOXY PATCHING COMPOUND

Run traffic over these road repairs in 7▲ hours. Quickly and effectively seal cracks, resurface hazardous bridge pavements and patch spalled areas with these new Sika Epoxy Compounds.

▲ SIKA EPOXY SURFACE-KOTE AT 70°F; OTHER SIKA EPOXY COMPOUNDS CURE IN 3 TO 4 HOURS.

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NEW MIDGET VIBRATOR

Very Versatile

7/8", 1 1/4", 1 5/8", and 2" HEADS

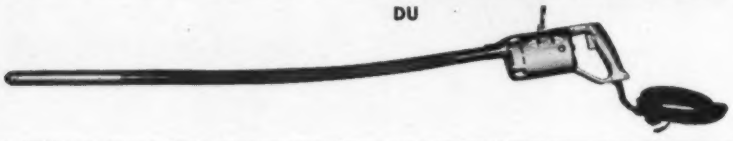
Stow Manufacturing Company has just put on the market a rugged, small electric vibrator that is extremely versatile. The model DU vibrator is available with either a 1¼" or ⅞" vibrator head and with various length flexible shafts from 2 ft. to 21 ft. long. These small vibrator heads really pack a wallop and are driven by a lightweight ¾ HP universal motor at 12,000 vibrations per minute.

The STOW DU Midget vibrator is shown here vibrating 1½ inch slump concrete tongue beams. Because of the small vibrator heads, the DU is ideal for jobs with narrow forms, such as precast work, vaults and manholes and on jobs where the reinforcement is closely spaced. It is also extremely useful for small jobs such as sidewalks, cellar floors, patios and swimming pools.

The DU vibrator may also be obtained with 1⅝" or 2" vibrator heads. All STOW vibrator heads have duplex ball bearings at each end supporting the eccentric weight and are sealed to retain the oil lubricant for life.

The ¾ HP universal motor weighs only 9 lbs., has a trigger switch in the handle, and features thermal overload protection.

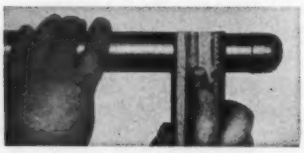
DU



Note: same motor as on DU vibrator.

DUA

1¼" HEAD FOR DU



⅞" HEAD FOR DUA

Ideal for narrow forms

- ¾ HP Universal motor
- Thermal Overload protection
- Operates on 115 volt AC or DC, 25 to 60 cycles
- 1¼" head standard on DU
- ⅞" head standard on DUA

For more information on the STOW DU Midget vibrator write Stow Manufacturing Company, 354 Shear Street, Binghamton, N.Y.

Stow Manufacturing Company
Dept. J-2, 354 Shear St.
Binghamton, New York

Please send me Concrete Equipment Cat. 580.

NAME.....COMPANY.....

ADDRESS.....

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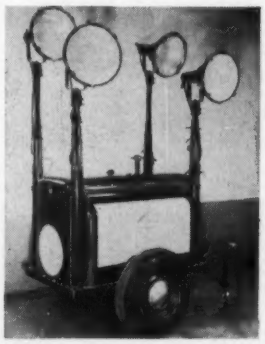
products

For additional information circle matching key number on reader service card on page 104C.



flood lights 430

A trailerized flood lighting unit which generates its own electric power is equipped with four floodlights each of which can be adjusted to any height up to 18 feet. Lights pivot in a complete circle. Generator capacity of the unit is 6,500 watts, and 8 extra outlet receptacles provide for operation of power tools or other equipment. Larger model is available. Pacific Mercury, 14052 Burbank Blvd., Van Nuys, Calif.

gas heater 431

A 45-pound gas heater produces 200,000 BTU. Heat delivery end is a venturi tube which sucks cold air in from floor and mixes it with hot air from the combustion chamber giving a warm blast and protecting floor area from excessive heat. If pilot or main flame goes out, gas line closes automatically. Aeroil Products Co., Inc., 200 Wesley St., South Hackensack, N. J.

products

For additional information circle matching key number on reader service card on page 104C.

expansion joints 432

Six-page bulletin on expansion joints gives information on the nomenclature and selection of this firm's joints and serves as a guide to making inquiries concerning specific applications. Illustrated bulletin contains general information on flanges, liners, covers, temperature ratings and other material of interest to joint users. Badger Manufacturing Co., 230 Bent St., Cambridge, Mass.

foundation coating 433

A pure steam distilled asphalt, available in 5-gallon pails, is designed specifically as a foundation coating. Material is a cutback type asphalt with a heavy solids content, and is said to give maximum waterproofing on any foundation or basement work. It may be used as waterproofing on both damp and dry surfaces. Edick Laboratories, Inc., 2358 S. Burrell St., Milwaukee, Wisc.

testing equipment 434

Illustrated 1960 catalog describes over 3,400 different items ranging from a pocket sized soil penetrometer to completely equipped mobile laboratories and nuclear testing equipment. Sections are included on equipment for testing soils, concrete, aggregate, and bituminous materials; mobile laboratories; general laboratory equipment; and drilling and sampling equipment. Referenced to ASTM and AASHO specifications, the catalog contains recommended equipment lists for specific types of testing projects. Soiltest, Inc., 4711 W. North Ave., Chicago, Ill.

products

For additional information circle matching key number on reader service card on page 104C.

flooring manual 435

A manual presents a line of flooring products for maintenance, repair, patching and resurfacing of interior and exterior floors and specifies what material is best suited to each job. The Monroe Co., Inc., 10703 Quebec Ave., Cleveland, Ohio.

highway snow removal 436

A brochure, "Calcium Chloride and Salt Mixtures," describes recent experience with the use of a mixture of sodium chloride and calcium chloride for clearing roads of ice or packed snow. Maintenance officials using chemical mixtures have found that the combination of three parts sodium chloride to one part calcium chloride gives best results for all conditions. Often the chemicals are mixed before the winter season and stored under tarpaulins or similar cover until ready for use. Calcium Chloride Institute, 909 Ring Bldg., Washington 6, D. C.

epoxy compounds 437

Formulated especially for the construction industry, a line of epoxy compounds includes joint sealants, crack sealants, bonding compound, patching compound, skid-resistant surfacing for highways and corrosion resistant surfacing for concrete. The materials are said to exhibit high bond to structural materials, stability over a wide range of temperatures, resistance to corrosion, compatibility to all concrete and masonry, and rapid curing. The manufacturer's sales engineers furnish specific recommendations for use in each application to the contractor at the job site and to the consulting engineer and the public works engineer in their offices. Sika Chemical Corp., 35 Gregory Ave., Passaic, N. J.

products

For additional information circle matching key number on reader service card on page 104C.

twin beam screed 438

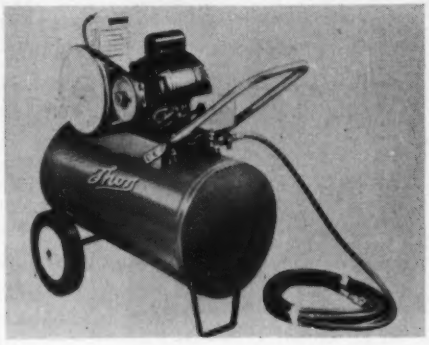
For striking off narrow slabs such as sidewalks and prestressed concrete beams, this lightweight twin beam vibrating screed consists of a vibrating unit driven by a 1 hp electric motor or 2⅓ hp gasoline engine, which transmits the vibration evenly to two beams. First beam strikes off concrete and the second removes air bubbles, leaving a smooth surface. Adjustable to any desired amplitude, screed is available in lengths from 4 to 12 feet. Stow Manufacturing Co., 354 Shear St., Binghamton, N. Y.

tractor shovel 439

A 16-page catalogue details features and performance capabilities of a 6,500-pound capacity rubber-tired tractor shovel. The 4-wheel drive, rear-wheel steer unit features full-power shift and torque converter drive. A choice of SAE rated buckets from 1¼ to 2⅞ cubic yards is offered, plus a number of interchangeable working tools including brush stackers, dozer blade, snow plows and material handling forks. J. I. Case Company, Racine, Wisc.

products

For additional information circle matching key number on reader service card on page 104C.



portable air compressor **440**

Air power for operation of air tools and attachments, paint sprayers, and cleaning of equipment on the job site is provided by a portable air compressor. Features 12-gallon capacity safety tested air tank, automatic air control switch, automatic relief valve for safe operation, heavy duty 20-foot air hose with air chuck, and a ½-hp shock resistant motor. Provides up to 150 pounds per square inch air pressure and operates from electric outlet or portable generator. Thor Power Tool Co., Aurora, Ill.

products

For additional information circle matching key number on reader service card on page 104C.

grinder **441**

A power grinder for finishing concrete surfaces weighs only 5 pounds 13 ounces. The tool is said to perform as well as the heavier grinders and to eliminate operator fatigue on vertical and overhead surfaces by its small size and light weight. Finisher uses standard abrasive stone cups and cutting wheels with a ⅝-inch 13 standard shaft and 3000 RPM speed. It employs precision ball bearings. Porter-Cable Machine Co., 1714 N. Salina St., Syracuse, N. Y.

joint former **442**

Booklet explains in detail the use and advantages of a plastic strip method for forming contraction joints in concrete pavement. Contraction joint theory and a comparison of major joint forming methods in use today are also covered in the booklet. American Sisalkraft Corporation, 55 Starkey Avenue, Attleboro, Mass.

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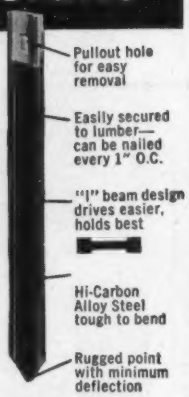

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